



## RESEARCH ARTICLE

# HPV-Based Cervical Screening versus Conventional Cytology: Is Cytology Still Relevant Today

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## ABSTRACT

**Background:** Cervical cancer screening has developed with the introduction of HPV testing, which has higher sensitivity than traditional cytology (Pap smear). However, the role of cytology in current clinical practice is debatable.

**Methods:** The retrospective study comprised 120 women who were screened over a two-year period. Data from HPV testing and conventional cytology were examined. Detection rates, sensitivity, specificity, and false-negative rates were evaluated.

**Results:** HPV testing was more sensitive (92%) than cytology (70%) ( $p=0.001$ ), while cytology was somewhat more specific (90% vs 85%) ( $p=0.04$ ). HPV discovered more CIN lesions (52 versus 34 instances). HPV testing resulted in significantly lower false-negative rates ( $p<0.01$ ).

**Conclusion:** Although HPV-based screening is more sensitive and early, cytology is still useful due to its higher specificity. A combination strategy may result in better screening results.

**Keywords:** HPV testing, Screening, Cytology, Specificity, Sensitive.

Indian J. Pharm. Biol. Res. (2026); <https://doi.org/10.30750/ijpbr.14.1.20>

## INTRODUCTION

Cervical cancer is one of the leading causes of cancer-related morbidity and mortality in women globally, particularly in poor countries. Early detection through suitable screening programs has significantly reduced the incidence and fatality rate of this disease. For decades, cytology-based screening with the Papanicolaou (Pap) smear was the primary technique of preventing cervical cancer[1].

Conventional cytology detects cellular abnormalities in cervical epithelial cells. While it has made important contributions to reducing the cervical burden, its limitations include inconsistent sensitivity, reliance on sample quality, and subjective interpretation. False negative results can lead to delays in diagnosis and therapy, resulting in a significant therapeutic burden[2].

The discovery of the role of high-risk human papillomavirus (HPV) in cervical carcinogenesis inspired the development of HPV-based screening methods. HPV testing detects the presence of viral DNA and has been shown to be more sensitive than cytology in identifying precancerous lesions. As a result, several global guidelines now recommend HPV testing as the primary screening approach. Despite these advancements, cytology remains widely used, particularly in low-resource settings. It is affordable, widely available, and has a rather good

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**How to cite this article:** Mittal DS, Sharma S, Ahmad MW. HPV-Based Cervical Screening versus Conventional Cytology: Is Cytology Still Relevant Today. Indian J. Pharm. Biol. Res. 2026;14(1):94-96.

**Source of support:** Nil

**Conflict of interest:** None.

**Received:** 28/03/2026 **Revised:** 08/04/2026 **Accepted:** 13/05/2026

**Published:** 20/05/2026

specificity. Cytology's relevance in the era of HPV-based screening is still debated[3].

This study will compare HPV testing to standard cytology in terms of detection rates, sensitivity, specificity, and false-negative rates. By analyzing retrospective data, we intend to determine if cytology still plays an important role in cervical cancer screening or if HPV testing should take over as the dominant modality[4].

## METHODS

- **Study Design:** Retrospective study
- **Duration:** 2 years
- **Sample Size:** 120 women

### Inclusion Criteria

- Women undergoing cervical cancer screening
- Age 21–65 years

### Exclusion Criteria

- Previous cervical cancer
- Prior hysterectomy
- Incomplete records

### Parameters Studied

- Detection of CIN lesions
- Sensitivity and specificity
- False-negative rates

### Statistical Analysis

The Student's t-test was used to compare continuous variables. The Chi-square test was used to examine categorical variables and establish relationships between groups. A p-value of <0.05 was judged statistically significant.

## RESULTS

**Table 1:** Demographic Characteristics

| Parameter       | Value      | p-value |
|-----------------|------------|---------|
| Mean Age        | 38.6 ± 9.4 | —       |
| Multiparous (%) | 72%        | 0.03    |

**Table 2:** Detection of CIN Lesions

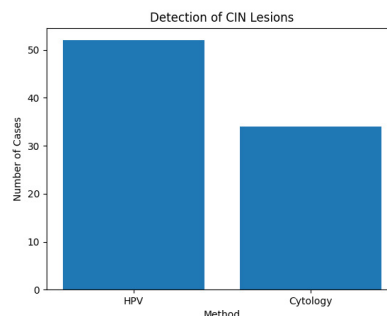
| Method   | Cases Detected | p-value |
|----------|----------------|---------|
| HPV      | 52             | 0.002   |
| Cytology | 34             | 0.002   |

**Table 3:** Sensitivity and Specificity

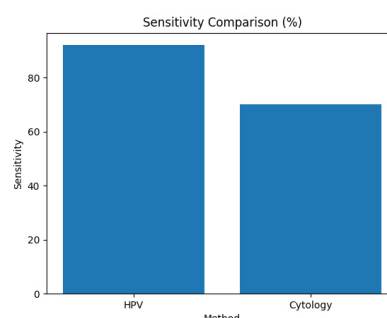
| Parameter   | HPV (%) | Cytology (%) | p-value |
|-------------|---------|--------------|---------|
| Sensitivity | 92      | 70           | 0.001   |
| Specificity | 85      | 90           | 0.04    |

**Table 4:** False-Negative Rates

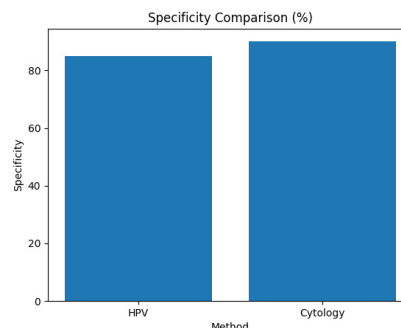
| Method   | Cases | p-value |
|----------|-------|---------|
| HPV      | 5     | 0.0008  |
| Cytology | 18    | 0.0008  |



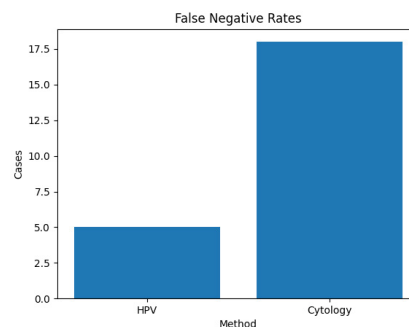
**Figure 1:** Detection of CIN lesions



**Figure 2:** Sensitivity comparison



**Figure 3:** Specificity comparison



**Figure 4:** False negative rates

## DISCUSSION

This retrospective study compares HPV-based cervical screening to traditional cytology and reveals significant differences in diagnostic performance. The data show that HPV testing has much higher sensitivity and lower false-negative rates than cytology, supporting its rising use as a main screening technique[5]. The higher sensitivity of HPV testing (92%) obtained in this study is consistent with current data. HPV testing reveals viral DNA before morphological changes occur, allowing for earlier diagnosis of precancerous lesions. Early detection is critical for preventing the development of invasive cervical cancer. In contrast, cytology is based on the detection of cellular abnormalities, which may not be present in the early stages, contributing to its reduced sensitivity[6].

However, cytology showed somewhat higher specificity (90%) than HPV tests (85%). This suggests that cytology is more accurate in identifying persons who are disease-free, resulting in fewer false-positive cases. High specificity is particularly important in reducing unnecessary follow-up procedures and associated anxiety. The HPV group had much more CIN lesions detected, underlining its efficacy in screening programs. Furthermore, the significantly decreased false-negative rate in HPV testing demonstrates its dependability in reducing missed diagnoses, an important feature in cancer preventive measures[7].

Despite these benefits, cytology remains important, particularly in resource-limited settings. It is affordable, readily available, and requires less sophisticated laboratory infrastructure. Furthermore, cytology can be used as a triage technique after a positive HPV test to assist stratify patients based on their risk. A combined method, including both HPV testing and cytology (co-testing), may provide the optimal balance of sensitivity and specificity. This method can increase overall screening accuracy while reducing unnecessary interventions[8].

The study's weaknesses include a retrospective design and dependence on existing records, which may create bias. Furthermore, histological confirmation of all instances was not available, which could have influenced accuracy. Finally, while HPV testing is clearly superior in terms of sensitivity and early diagnosis, cytology continues to play an important complementary role. To attain the best results, future screening programs should include both modalities[9].

## CONCLUSION

This study found that HPV-based cervical screening outperformed traditional cytology in terms of sensitivity,

detection rates, and false-negative cases. HPV testing enables the early detection of precancerous lesions, making it a more effective primary screening technique. However, cytology is still clinically relevant due to its superior specificity and capacity to minimize false-positive results. It remains especially useful in low-resource settings and as a triage strategy after HPV positive.

The findings indicate that a combination screening strategy may be the most balanced and effective way to prevent cervical cancer. While HPV testing should be prioritized, cytology should not be completely eliminated. Further prospective studies and long-term follow-up are needed to fine-tune screening procedures and improve patient outcomes.

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